

THE CLAIMS

What is claimed is:

- 5 1. A golf ball comprising:
 a center comprising a material having a molecular weight of greater than
 about 200,000 and a resilience index of at least about 40; and
 a cover layer comprising a polyurethane composition formed from a
10 prepolymer having less than about 14 percent by weight unreacted
 isocyanate groups.
2. The golf ball of claim 1, wherein the material is formed from a conversion
 reaction comprising a cis-to-trans catalyst and a polybutadiene material.
- 15 3. The golf ball of claim 2, wherein the polybutadiene has a vinyl- isomer
 content of less than about 2 percent by weight, a cis-isomer content of at least about 95
 percent by weight, or both.
4. The golf ball of claim 2, wherein the cis-to-trans catalyst comprises at least
20 one of an organosulfur compound, an inorganic sulfur compound, an aromatic
 organometallic compound, a metal-organosulfur compound, tellurium, selenium, elemental
 sulfur, a polymeric sulfur, or an aromatic organic compound.
5. The golf ball of claim 1, wherein the prepolymer has less than about 7.5
25 percent by weight unreacted isocyanate groups
6. The golf ball of claim 1, wherein the polyurethane composition comprises an
 isocyanate, a polyol, and a curing agent.
- 30 7. The golf ball of claim 6, wherein the isocyanate comprises
 4,4'-diphenylmethane diisocyanate, polymeric 4,4'-diphenylmethane diisocyanate,
 carbodiimide-modified liquid 4,4'-diphenylmethane diisocyanate, 4,4'-dicyclohexylmethane
 diisocyanate, p-phenylene diisocyanate, toluene diisocyanate, isophoronediiisocyanate, p-

methylxylene diisocyanate, m-methylxylene diisocyanate, o-methylxylene diisocyanate, or a mixture thereof.

8. The golf ball of claim 6, wherein the polyol comprises a polyether polyol,
5 hydroxy-terminated polybutadiene, polyester polyol, polycaprolactone polyol, polycarbonate polyol, or mixtures thereof.

9. The golf ball of claim 6, wherein the curing agent comprises a polyamine
curing agent, a polyol curing agent, or a mixture thereof.

10. The golf ball of claim 1, wherein the cover layer has a thickness of less than
about 0.05 inches.

11. The golf ball of claim 1, wherein the center has an outer diameter of at least
15 about 1.55 inches.

12. The golf ball of claim 1, wherein the cover comprises an inner cover layer and
an outer cover layer, the inner cover layer disposed between the center and the outer cover
layer.

13. The golf ball of claim 12, wherein the inner cover layer comprises an ionomer
resin, a polyurethane, a polyetherester, a polyetheramide, a polyester, a dynamically
vulcanized elastomer, a functionalized styrenebutadiene elastomer, a metallocene polymer
nylon, acrylonitrile butadiene-styrene copolymer, or blends thereof.

14. A golf ball comprising:
a center comprising a material having a molecular weight of greater than
about 200,000 and a resilience index of at least about 40; and
a cover layer having a thickness of about 0.05 inches or less comprising a
30 polyurethane composition formed from a prepolymer having less than
about 7.5 percent by weight unreacted isocyanate groups.

15. The golf ball of claim 14, wherein the prepolymer comprises an isocyanate and a polyol.

16. The golf ball of claim 15, wherein the isocyanate comprises less than about
5 0.1 percent free monomer groups.

17. The golf ball of claim 14, wherein the molecular weight of the center material is about 300,000 to about 500,000.

10 18. The golf ball of claim 14, wherein the golf ball further comprises an intermediate layer formed of an ionomer resin.

19. The golf ball of claim 14, wherein the polyurethane composition is thermoset.